Bandolier 87

What do we think?
What do we know?
What can we prove?

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Zebedee on speed

This month ***Bandolier*** reports Karelian tunes for the cholesterol fairy, ordering blood tests in primary care, outcomes from resuscitation and paracetamol and INR.

- The curse of Karelia was the high rate of heart disease in the 1970s, a bit like Glasgow and Belfast now. This report summarises an inter-village tournament for cholesterol reduction. This is not just about the rural idyll. There are many communities where community spirit can be harnessed to promote better health.
- Reducing unnecessary laboratory tests is a good idea, and computer aids help when based on solid guidelines, at least in Holland. Reducing lab tests to reduce the number of falsely abnormal results sounds like good medicine, provided that the necessary abnormal results are still reported.
- Now we have defibrillation in public places it is opportune to look at a decision aid for resuscitation. ***Bandolier*** has a private worry that the neurological status of the survivors is not well reported.
- What do you advise for analgesia when people are anticoagulated? The old textbook teaching that paracetamol is best may need a bit of thought. It looks like thinner than expected blood may follow more than four 1 gm doses a week. Fine if you know about it, but for some older patients with funny diets, arthritis and atrial fibrillation, something of a nightmare.

Cold calls swim against the tide

Waiting on hold at the call centre is probably one of the most frustrating things in modern life. All the helplessness you can imagine accompanied by ghastly musak.

Not even close to describing the frustration of chronic disease in 2001. There you are, walking along the street, when a wall falls on you, or you fall into the traffic. Great acute care thrusts you, unemployable, back into the bosom of your family. Others have their disabilities from birth.

Only from your own experience or through one of your patients can you feel the impotence in dealing with the infrastructure, let alone the distress brought on by the condition. That's the point of the call centre analogy; the frustration we feel on hold, waiting for *someone* to answer our mundane moan, is just a miniscule fraction of what chronic health problems do to people. ***Bandolier*** doesn't get to write about these problems, because there isn't much evidence to report. Being proud of your health care delivery means striving for the difficult targets as well as the easier ones.

Cholesterol lowering in Karelia

Having the evidence is one thing. Knowing how to implement it is another. With cholesterol we know that getting it lower, for individuals and populations, confers a lower risk of heart disease. The question is how to achieve this.

In Karelia in the 1970s they had one of the highest rates of heart disease in the world, with mean cholesterol levels in men aged 30-59 years of about 7 mmol/L. A lot of effort was put into trying to reduce the high rate of heart disease. One innovative way was to have a competition between small villages to see which one could reduce its average cholesterol most over a two-month period.

Village competition [1]

There were two competitions, in 1991 and 1997. Small villages with populations of 150 to 300 people aged 20-70 years of age. At least 70% had to have an initial cholesterol measured (by finger prick) and at least 80% of these had to have a final cholesterol measured two months later. So there had to be a minimum participation rate of 56%.

Villages had to organise the cholesterol measurements themselves in collaboration with a local heath centre, a heart association and community nurses. Participants had to complete a questionnaire at the end of the competition about changes in dietary habits, risk factors and physical activity. A diet index was calculated ranging from –3 (maximum unhealthy changes) to +3 (maximum healthy changes). The villages also had to organise activities to encourage changes to lifestyle and diet themselves, and there was a prize of about £1,500 for the village with the largest mean percentage decrease in cholesterol.

Did it work?

The results for all the villages in the two competitions are shown in Figure 1. In 1991 seven villages participated with

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a total population of about 1000. All hit the target 56% participation rate. The mean cholesterol was reduced in six of the seven villages, by a mean of 5.8%. The winning village had a mean cholesterol reduction of 11%.

In 1997 16 villages participated with total population of 2685. Five failed to hit the 56% participation rate. The mean cholesterol reduction in all villages was 9%. The winning village had a mean cholesterol reduction of 16%.

Reduction in cholesterol was associated with changes with fat spread on bread, especially in the 1997 competition with a large increase in stanol use (from 4% to 21%) and a reduction in butter use (from 18% to 10%). The greater change to diet (as measured by the diet index), the greater reduction in cholesterol (Figure 2).

In the best four villages for cholesterol reduction in 1997 there were major changes towards a healthier diet, over and above changes in fat spreads (Table 1). Eating more fruit and vegetables, and eating more fish, confer benefits in addition to those from dietary fat.

Lessons learned

As expected, the successful villages had organised more self-help groups and activities to inform villagers encourage them to make and sustain changes to their diet. Community activity was both possible and worked, because it harnessed peer pressure for good. In the 1997 competition the largest falls were in housewives, and they were key in informing men about dietary changes.

Of course, this might be fine in a short burst of activity over two months, but long-term changes do not necessarily follow. In the 1997 winning village about two-thirds of the cholesterol reduction had been maintained after a year. And in North Karelia as whole, activities over a quarter of a century have brought the mean cholesterol of men aged 30-59 years down from 7.0 mmol/L to about 5.6 mmol/L, and reduced the number of coronary heart disease deaths by 73%.

Rural Finland is not urban Britain. But there are distinct populations with high risks of heart or other disease, and community awareness and action is one way of achieving change.

Figure 1: Mean cholesterol before and after the competition. Each symbol is a village

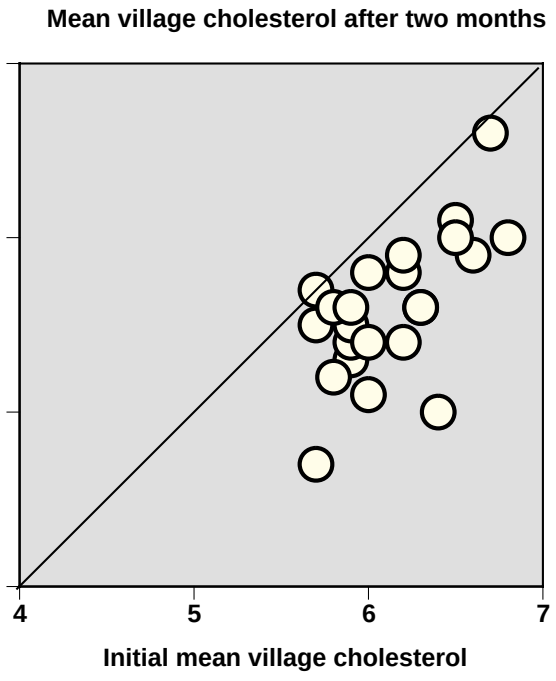
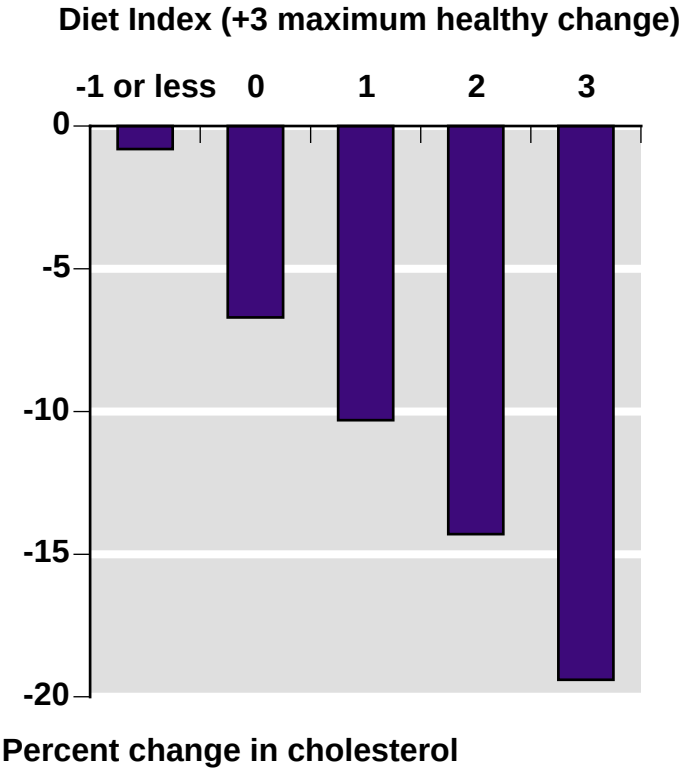


Figure 2: The reduction in cholesterol was greatly influenced by changes in diet



References:

1 P Puska et al. Village competition as an innovative method for lowering population cholesterol. European Heart Journal Supplements 1999 1 Supp S; S64-S72.

Table 1: Changes towards a healthier diet in the best four villages in the 1997 competition

Dietary change	Percent
Ate more vegetables	76
Ate less fatty meats	69
Used less cooking fat	69
Changed fat spread on bread	68
Ate more fruit and berries	64
Used less spread	63
Changed cooking fat	63
Ate less full-fat cheese	61
Drank less whole milk	39
Ate less full-fat yoghurt	39
Ate more fish	32

DECISION SUPPORT FOR ORDERING BLOOD TESTS IN PRIMARY CARE

General practitioners order blood tests on one of every 25 patients they see. They will usually order not one test, but perhaps seven or eight different tests each time. Since they see a lot of patients, that means they order a lot of blood tests. Three things follow. First that this costs a lot. Second, that GPs have a lot of information to digest. Third, since normal ranges are often defined as the middle 95% of results in a normal population, 5% will be "abnormal" even when there is no disease. So GPs end up chasing lots of normally abnormal results with nothing to show.

The picture is even more complicated because all the guidelines and guidance being produced – about 5 kg of it, about a metre high, in each GP's office. And now the GPs are being audited on these guidelines. So can technology help, and how do we know it helps? A new randomised trial from Holland [1] shows the way.

Trial

The setting was the Delft region of Holland with 60 general practitioners in 44 practices with a median of about 3,400 patients per practice. The practices had replaced paper-based patient records with electronic records. Practices were randomised by computer-generated random numbers to receive one of two versions of a computer decision support system for blood test ordering.

One version initially displayed a reduced list of tests. It offered GPs an initial set of 15 tests covering most of the clinical situations seen in primary care. Other tests could also be ordered. Test ordering could be customised by adding or deleting tests for individual patients.

The alternative system was similar, but based on the 54 guidelines from the Dutch College of General Practitioners. These focus on symptoms commonly seen in primary care, or diseases commonly seen in primary care. GPs could select guidelines to see that tests being ordered (or not ordered) were relevant for a particular clinical situation.

Paper forms could still be used, though computer ordering was preferred. The introduction of the computer decision aid systems was accompanied by a three month phase-in period after an orientation presentation. Information on ordering was then followed for a year, with the main outcome being the number of order forms and tests ordered.

Results

The main results are shown in Table 1. There was no difference between the baseline characteristics of practices or GPs. The different computer systems made no difference to the number of patients for whom blood tests were ordered. Computer generated blood test numbers was lower with the guideline assistance. The number of tests per request was down by an average of 20%, from 6.9 ± 1.6 (SD) to 5.5 ± 0.9. This was significantly lower.

Table 1: Main results

	Restricted	Guidelines
Number of practices	21	23
Number of GPs	29	31
Number of patients	77,336	78,461
Number of test order forms	12,742	12,668
Computer ordered percent	88	71
Average number of tests	6.9	5.5
Requests per patient per year	0.16	0.16
Tests per patient per year	1.14	0.89

Not all tests were equally affected. Of the 20 most commonly requested tests that made up 80% of tests ordered, significant reductions occurred only in some (Table 2). But these were large reductions, of about half for some liver enzymes and about a third for some haematological tests.

Comment

The implications of this are really impressive. Dutch GPs without computer-generated guideline support ordered 1.14 tests per patient per year. With guideline support this reduced to 0.89 tests per patient per year. The implication for a laboratory serving a million people would be that guideline-assisted test ordering would reduce the workload by 250,000 tests a year, or about 5,000 tests a week. For particular tests, not all of them inexpensive, the impact would be significant.

Moreover, because this behaviour would be based on guidelines, presumably built around best evidence, the saving would have no negative impact on the health of the population. Indeed, perhaps as many as 12,500 falsely abnormal test results would be avoided, as well as additional unnecessary diagnostic procedures, hospital visits, professional concern and personal worry.

Improved quality does not necessarily come at increased cost. Doing simple things well works extremely well. A metre of paper guidelines doesn't help. On the computer, available when we need them, they seem to.

References:

1 MA van Wijk et al. Assessment of decision support for blood test ordering in primary care. A randomized trial. Annals of Internal Medicine 2001 134: 274-281.

Table 2: Results for individual tests

Test	Percent reduction
Potassium	50
AST	49
Gamma-GT	46
Free thyroxine	43
ALT	38
MCV	33
Creatinine	32
Erythrocyte count	30
ESR	28
Haematocrit	26
Differential leucocyte	26
Leucocyte count	23
Hb	18

DISCONTINUING IN-HOSPITAL CARDIAC RESUSCITATION – VALIDATING A CLINICAL DECISION AID

The evidence rules for diagnostic tests or clinical decision rules are not the same as for treatments. Randomised trials have their place, but the hard work comes from:

- collecting good quality information,
- finding measurements that correlate with outcome,
- formulating a clinical decision rule,
- validating the rule on an independent data set.

When the rules have been shown to work, only then may a randomised trial make sense.

From Canada comes a superb example of a decision aid for perhaps one of the most difficult clinical decisions, discontinuing resuscitation attempts after a cardiac arrest [1].

Decision aid

The decision aid had previously been determined using data from two randomised trials [2]. It had been found that all resuscitated patients who were eventually discharged from hospital had:

- A witnessed arrest
- An initial cardiac rhythm of ventricular tachycardia or ventricular fibrillation
- A pulse within the first 10 minutes of chest compression

The aid proposed that physicians could safely withdraw resuscitative efforts on patients who did not satisfy the decision aid since none were discharged from the hospital.

Validation

The validation of the decision aid was carried out by analysis of a resuscitation registry at a medical centre in Georgia in which all in-hospital arrests between 1987 and 1996 were entered into a registry, and in which resuscitation was handled by multidisciplinary teams according to standard protocols. A detailed coding sheet accompanied each resuscitation attempt, and hospital records were reviewed to ensure that all resuscitation events were recorded.

Results

After excluding resuscitation events for a variety of reasons (no chest compression, information missing) there were 2181 attempted resuscitations on 1884 patients. They had an average age of 65 years, and half were women.

Table 1 shows the results of applying the decision aid. There were 1912 patients in which the decision aid predicted some chance of a hospital discharge, and 17% of these were eventually discharged. There were 269 in which the decision aid predicted no chance of discharge. Fifty-three responded enough to be transferred to intensive care, and 26 remained alive for at least 24 hours (range 1 – 29 days). Three, (1%) patients were discharged.

The three discharged patients were:

1 A 76 year old man with dementia, hypertension and COPD and oropharyngeal cancer who was eventually transferred to another hospital, required major medical aid, and who died two months later.

2 A 43 year old man with COPD and alcoholic cardiomyopathy. He was discharged to a nursing home because of problems with caring for himself despite minimal ischaemic damage.

Table 1: Results of applying the decision aid to 2181 attempted resuscitations

Decision aid The patient has a chance of discharge from hospital if any of the following is true:	Applying the decision aid to 2181 attempted resuscitations		
The arrest was witnessed	1	1721 arrest witnessed 287 (17%) discharged	Some chance of discharge
		460 arrest **NOT** witnessed 40 (9%) discharged	**OF WHOM**
The initial cardiac rhythm was ventricular tachycardia or ventricular fibrillation	2	49 initial rhythm VT or VF 10 (20%) discharged	Some chance of discharge
		411 initial rhythm **NOT** VT or VF 30 (7%) discharged	**OF WHOM**
Pulse was regained during the first 10 minutes of chest compression	3	142 pulse regained within 10 minutes 27 (19%) discharged	Some chance of discharge
		269 pulse **NOT** regained within 10 minutes 3 (1%) discharged	**Decision aid predicts no chance of discharge**

3 A 65 year old woman who arrested following back surgery, with no ischaemic injury but who was discharged to a nursing home because of complications with surgery.

Comment

This decision aid was validated in a separate group of patients to that in which it was developed. Experts in resuscitation after cardiac arrest will have their own views about the applicability of decision aids in this most difficult situation. They may also question whether the situation in hospitals in North America, with high staffing levels, makes the decision aid valid in situations with lower staffing levels, where the actual witnessing of an event might be much less likely, and the decision aid less useful.

The strength of the study is that it demonstrates beautifully that decision aids can be derived for even difficult clinical situations, and that the methods required produce robust results when applied. For likelihood ratio aficionados, the positive likelihood ratio was 1.2 (not very useful), but the negative likelihood ratio was 0.06 (making a rule-out rule possible).

References:
1 C van Walgrave et al. Validation of a clinical decision aid to discontinue in-hospital cardiac arrest resuscitation. JAMA 2001 285: 1602-1606.
2 C van Walgrave et al. Derivation of a clinical decision rule for the discontinuation in-hospital cardiac arrest resuscitation. Archives of Internal Medicine 1998 158: 129-134.

THINGS THAT AFFECT OUR INR

Sometimes we spot something, half read it, forget it, vaguely remember something about it, and then one day we need to have the information now. For ***Bandolier*** that happened with a paper on factors affecting the stability of INR, and especially the effects of paracetamol [1]. Even a hint of what a paper was about can lead to its swift retrieval with modern electronic methods.

Study

This was a case control study conducted at the Mass Gen in Boston. The study was conducted in patients attending the anticoagulant therapy unit (2000 patients) over a single year who had been on warfarin for at least one month, had a target INR of 2.0 to 3.0, and were able to participate in a telephone interview personally or through their carer.

Participants were identified from a daily log of INR tests. Cases were those with an INR greater than 6.0 reported within 24 hours, whose target INR was 2.0 to 3.0; results were verified with a duplicate test. Controls were randomly selected from patients whose target was 2.0 to 3.0 and who had actual values of 1.7 to 3.3.

Some selected cases and controls were ineligible because they did not speak English or because they did not have a telephone, and a few declined to participate. For the others two trained interviewers conducted a scripted interview lasting 10-15 minutes asking about the four weeks before the test. It asked about medicines, newly prescribed medicines, over the counter medicines, dietary habits, alcohol consumption, and prescribed and consumed warfarin doses. Dietary questions specifically asked about gross changes in eating habits, and specifically about 12 foods with high vitamin K content (avocado, broccoli, sprouts, cabbage, peas, lettuce, liver, spinach etc).

Results

There were 93 patients with an INR of more than 6.0 (range 6.1 to 30). For most of them the raised INR represented a recent deterioration in control of their anticoagulation. The mean INR for the test before the four week study period was 2.5 for these same patients, mostly in the range 1.7 to 3.3. Cases and controls were similar in age (mean 70 years), sex (50% women), race (97% white), length of warfarin therapy, and reason for anticoagulation. For half it was atrial fibrillation.

Independent risk factors for an increased risk of INR above 6.0 were (Table 1):

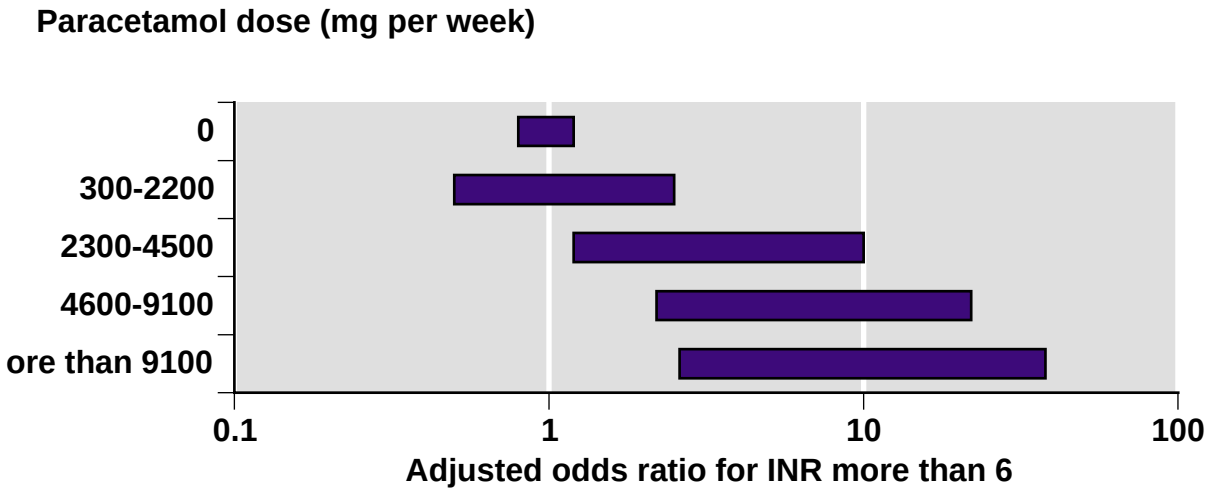
- advanced malignancy,
- newly started medicines with the potential to interfere with warfarin metabolism
- taking more warfarin than was prescribed
- a decreased consumption of foods rich in vitamin K
- acute diarrheal illness

Eating more foods rich in vitamin K and a moderate alcohol intake of between one drink every other day to two drinks a day were associated with a lower chance of increased INR.

Table 1: Independent risk factors for INR above 6.0

Risk factor	Odds ratio 95% CI
For increased chance of INR >6	
Advanced malignancy	16.4 (2.4 to 111)
Newly started potentiating medicine	8.5 (2.9 to 25)
Warfarin dose more than prescribed	8.1 (2.2 to 30)
Eating less vitamin K rich food	3.6 (1.3 to 9.7)
Acute diarrhoeal illness	3.5 (1.4 to 8.6)
For decreased chance of INR >6	
Eating vitamin K rich foods	0.7 (0.3 to 0.9)
Alcohol (half to two drinks a day)	0.2 (0.1 to 0.7)

Figure 1: Effect of paracetamol dose on risk of INR above 6.0



Paracetamol was also associated with increased risk of elevated INR. Taken mainly for acute pains, the more of it used in the week before the test, the greater the chance of a raised INR (Figure 1). More than nine 500 mg tablets a week gave an odds ratio of 7, and more than 18 tablets a week an odds ratio of 10.

Comment

When the INR is above 6 there is an increased risk of major haemorrhage. Maintaining INR values in target ranges in primary care is not always straightforward. There are many hundreds of thousands of people on warfarin, and an average primary care group of 100,000 people may have 1,500 patients on warfarin, predominantly older people with other disorders who take other drugs. The possibilities for drug interactions, and interactions with other features of their lives, is substantial.

The strength of this study from Boston is that it recruited all eligible patients over a year from a busy clinic. It tried to find answers to questions often asked by patients and professionals about whether or how behaviour interferes with INR. Foods, alcohol, over the counter medicines feature in the most commonly asked questions. Answers vary widely – no alcohol, moderate alcohol, doesn't make any difference. Popular textbooks warn about aspirin as analgesics, and often NSAIDs, and can and do suggest paracetamol as a safe alternative.

The truth is different. Eating sensibly, drinking sensibly, taking the right dose of warfarin as prescribed, and avoiding more than five 500 mg (seven 325 mg) tablets of paracetamol a week all help avoid excessively raised INR and give good control. Those dealing with warfarin in primary care could do worse than read this paper and the accompanying editorial [2].

One reason for reading both in some detail is to convince oneself that the interaction with paracetamol is genuine, because the repercussions are major. The background literature describing other types of studies from the dim past in which paracetamol has been shown to interfere with warfarin metabolism and increase the prothrombin time will probably convince.

Analgesia for those on warfarin becomes more difficult if paracetamol is not to be used, nor aspirin, nor NSAIDs. Other nonopioid analgesics that do not interfere with liver metabolism of warfarin are not easy to come by.

References:
1 EM Hylek et al. Acetaminophen and other risk factors for excessive warfarin anticoagulation. JAMA 1998 279: 657-662.
2 WR Bell. Acetaminophen and warfarin. Undesirable synergy. JAMA 1998 279: 702-703.

Computer decision aids for anticoagulation

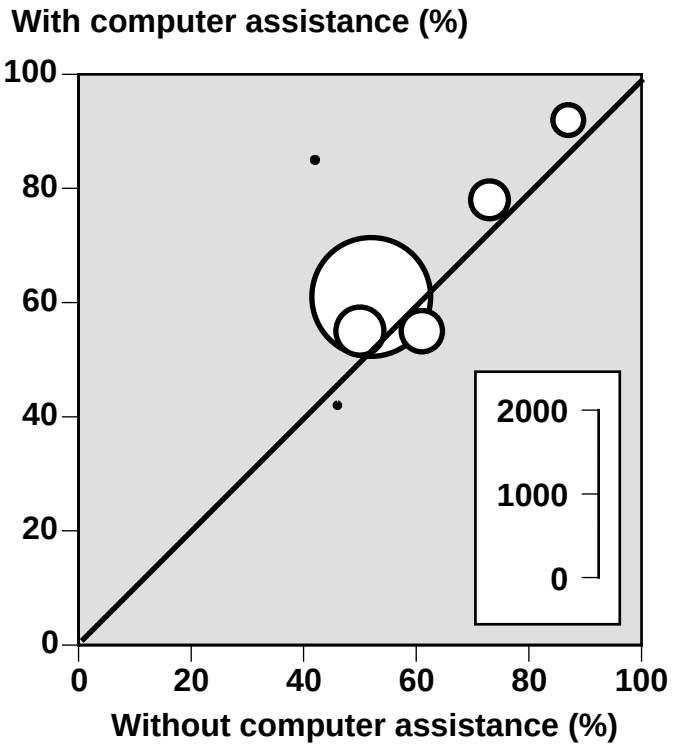
One of the benefits of using computers is that they remember things that we may forget. They can also remember numbers, and perform calculations, and should be better than we are at coming up with the right answer more often, if programmed correctly at the beginning. The trouble with people is that their programming and processing are both of variable quality.

One place to test the ability of computers to aid in therapeutic quality should be in anticoagulation, where the risks and benefits depend heavily on maintaining a narrow limit. Small improvements in quality control would be useful. Even better would be a randomised trial comparing computer with standard therapy, and even better than that would be a meta-analysis of such studies [1].

Review

The review [1] searched MEDLINE using some standard search terms. Papers were selected if assignment of patients to computer systems or not was randomised, and if there was information available relevant to the analysis. The outcomes were the number of tests within the target range for

Figure 1: Results of seven RCTs of computer assisted anticoagulation - percent of tests within target range for INR



anticoagulation. Also assessed was any information on major haemorrhage or bleeding events.

Results

There were seven studies with 3416 anticoagulation tests. Computers generally did better (Figure 1). With computer systems 65% of tests were within target compared with 59% without computers. The number needed to treat was 17 (95% confidence interval 11 to 38), meaning that for every 17 patients whose anticoagulation was controlled by a computer system, one more would have a test result within target compared with not using a computer system. Other statistical outputs are in Table 1, including the odds ratio quoted in the paper.

There were 14 major haemorrhages among 700 subjects in the computer groups (2.0%), versus 25 among 636 in the control groups (3.9%). The relative risk was 0.51 (0.27 to 0.97), and the number needed to treat to prevent one major haemorrhage was 52 (26 to 1013).

There were 25 major haemorrhages, deaths and thromboembolic events among 700 subjects in the computer groups (4.0%), versus 39 among 636 in the control groups (6.1%). The relative risk was 0.65 (0.40 to 1.04).

Comment

There are several interesting things about this review and meta-analysis. Firstly it identified seven randomised trials, compared with four (three common) found for another review of computerised systems [2]. The most likely reason for the difference was different inclusion criteria.

Table 1: Different ways of describing the same result (better control with computer)

Output	Result
Odds ratio	1.29 (1.12 to 1.49)
Relative risk	1.10 (1.04 to 1.16)
NNT	17 (11 to 38)
Percent in target with computer	65 (63 to 67)
Percent in target without computer	59 (57 to 62)
Percent bleeds with computer	2.0 (1.0 to 3.0)
Percent bleeds without computer	4.4 (2.8 to 6.0)

Second, it showed that computer-aided decisions resulted in a moderate improvement in quality, as well as reducing by half the number of major haemorrhages. The amount of information is still not great, so we must remain cautious. But adverse events can often be expensive for healthcare systems as well as tragic for patients and professionals. A back of envelope calculation would suggest that saving one major bleed for every 50 patients would make any computer system pay for itself.

Third, the paper showed how odds ratios can be wrong and misused. Here the odds ratio was 1.29, when the relative risk was 1.1. Some argue that odds ratios should not be used when proportions are high [3]. Even worse, the authors comment "the use of a computer for anticoagulation optimization increased by 29% the proportion of visits where patients were within the therapeutic range". Oh no it didn't: it went up from 59% to 65%, and increase of about 10%.

Misuse of odds ratios is common, and it is often wrongly taught. The real problems come when there is genuine disagreement about how and what to use in particular situations. Not everyone agrees about when odds ratios are right and relative risk wrong, or vice versa [4].

Odds ratios are not for us common folk.

"All policy decisions should be based on absolute measures of risk: relative risk is strictly for researchers only" [5]

If we stick to absolute numbers we can probably work it out for ourselves as long as we have a statistical tick.

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1 G Chatellier et al. An overview of the effect of computer-assisted management of anticoagulant therapy on the quality of anticoagulation. International journal of Medical Informatics 1998 49: 311-320.
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5 Rose. J Roy Coll Phys Lond 1991 25: 48-52

Book reviews

Advancing Clinical Governance. Edited by Myriam Lugon and Jonathan Secker-Walker. Royal Society of Medicine Press, 2001. ISBN 1 95315 471 7. pp 213 £18.50.

Quality control (for that's what clinical governance is, but using some form of newspeak to make it sound sexy) is always a shock to organisations when first introduced. Organisations all react in exactly the same way, a mixture of rage and denial (from the majority), excitement (from a few), or cool calculations with an eye to the main chance (a tiny few).

Lesson number one is don't get angry, and lesson number two is don't get excited. The Mr Angrys will just waste their time, and dissipate energies better spent at something else, and preferably getting to grips with this new quality agenda and figuring out how to use it best for themselves, their team, and their customers. Mrs Excited will waste away waiting for something to happen today, but it never will. It will always happen tomorrow, or that's how it often looks.

Look forward and progress is glacial. Look back, and it is frantic. The simple lesson is that quality control (or clinical governance) is too important for any of us to dismiss it. If we want to have an existence that is in any way congenial, we have to be prepared to be active participants. Zealots rarely make good governors, and all that is required for the zealots to take over is for good folk to do nothing because they think it will bring them a quiet life. It won't.

We all have to get a grip on quality control. Start by finding out as much as you can about what other people have written, especially those who have devoted some thought to it. A good start would be to read this book. It won't answer all questions, and there will be some bits you (more or less) know already. But there is wisdom, and there is an astringent quality to some of the chapters. That on the "myth of accurate clinical information" has real bite. Stacks of contacts and sources are also given. Read this and you won't be caught out in this brave new world.

Critical appraisal of the medical literature. David Marchevsky. Kluwer Academic/Plenum Publishers, New York, 2000. ISBN 0 306 46474 8. pp 304 £55.25.

This is at the same time an interesting and a curious book. It is written by a psychiatrist for, for example, psychiatrists preparing for a paper of MRCPsych examinations. In the introduction it claims to want to reach a general audience with little or no background of systematic critical appraisal.

Make no mistake about it, everything you might want to know is in this book. It is logically ordered, it is thorough, it is detailed. But, by golly, it is a bit of a tough read. Open it at random and one is into details of chi-square testing, the z-statistic, and multiple prediction.

All the usual critical appraisal stuff seems to be there, and there is quite a nice description of bias. The way in which statistical significance versus validity versus importance versus usefulness is described is resonant of some of the most sensible of ways of looking at data. But it's all very sparing in the use of words and examples, and you ***really*** want to have to know the answer to keep digging.

It is a fantastic top-shelf book. When you want to know something, you know where you will find it - in here. But the style and price both militate against carrying it in your pocket for light relief. It is also curiously mis-titled (without any suggestions for a better one, though).

Official Health Statistics - An Unofficial Guide. Edited by Susan Kerrison and Alison Macfarlane. Arnold, London, 2000. ISBN 0 340 73132 X (pb). pp290 £16.99.

This isn't a list of tables saying how many people have what diseases, but a primer on how information relating to health and health services are collected, and sometimes on how they are used, and often why they are different.

How many people in the UK are in paid employment? Well, it depends on which of three different information collecting systems we use or believe. The maximum difference is one or two million people in 23 million or so. The book goes into some detail about the differences, and why they occur and how real they are. So, after a few pages, the reader is an informed reader.

And that's how it goes. From, topically, the census, through notification of diseases, health inequality, money, occupation, environment, the NHS and social services. Each chapter is a little jewel, coming with boxes for sources on paper and electronic. For just about each of the chapters there is a discussion about how the information is collected, and what it means. This is important, because there's absolutely no point having a heated discussion about health inequality, for instance, if we have no idea of the relevance or veracity of the "fact" we are discussing.

Not a light read perhaps, but an illuminating one, and to some of us a fun one. It will make you think about the "evidence" often trotted out about health statistics. It will make for more informed decisions.

Now it's off to the census to decide how much truth to tell!

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